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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/909,532	07/20/2001	Kie Y. Ahn	303.377US3	1731

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EXAMINER

GUERRERO, MARIA F

ART UNIT	PAPER NUMBER
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2822

DATE MAILED: 09/16/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/909,532

Applicant(s)

AHN ET AL.

Examiner

Maria Guerrero

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 24 June 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 49-73,77 and 79-83 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 49-73,77 and 79-83 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 15.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

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### **DETAILED ACTION**

1. This Office Action is in response to the Amendment filed June 24, 2003.

Claims 1-48 and 74-76, and 78 are canceled.

Claims 49-73, 77, and 79-83 are pending.

### ***Information Disclosure Statement***

2. The information disclosure statement filed June 24, 2003 has been considered.

### ***Terminal Disclaimer***

3. The terminal disclaimer filed on February 10, 2003 disclaiming the terminal portion of any patent granted on this application, which would extend beyond the expiration date of U.S. Patent No. 6,350,704 has been reviewed and is accepted. The terminal disclaimer has been recorded.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 49-73, 77, and 79-83 are rejected under 35 U.S.C. 103(a) as being unpatentable over Havemann et al. (U.S. 5,488,015) in view of Sigh et al. and Loboda et al. (U.S. 5,818,071) (of record).

Havemann et al. teaches providing a plurality of circuit elements on a substrate,

coating at least a portion of a surface of the substrate and at least one of the plurality circuit elements with a mixture of oxide and carbon sources (TEOS) (Fig. 3A-3B, col. 9, lines 11-20). Havemann et al. teaches transforming mixture to a first porous dielectric layer, forming vias in the first porous dielectric layer, forming metal layers in the vias, and using a CMP process to obtain a desired thickness of the porous dielectric (Fig. 3A-8D, col. 6, lines 15-25, col. 7, lines 20-36, col. 8, lines 18-65, col. 10, lines 43-45).

Havemann et al. discloses forming a second porous dielectric layer (Fig. 4B)

Furthermore, Havemann et al. shows the porous layer having a dielectric constant of less than 2.0 (col. 2, lines 33-40) and the porous dielectric layer should contain pores radius at least an order of magnitude of 10 nanometers (100 Angstroms) (col. 4, lines 55-62).

Havemann et al. does not specifically show the porous dielectric layer being silicon oxycarbide and the pyrolyzing the mixture. However, Sigh et al. discloses coating at least a portion of a surface of a substrate with a mixture of oxide and carbon sources and transforming the mixture into a porous oxide insulator on the integrated circuit. Sigh et al. also teaches silicon oxycarbides having an average pore size of ~ 30 angstroms, the silicon oxycarbides display a greater thermal stability of surface area than pure silica (page 2696-2704).

In addition, Sigh et al. teaches using methyldimethosysilane (MDMS), tetraethoxysilane (TEOS), and silicon alkoxides (page 2696). The step of transforming includes heating between 450° and 1200° C at 0.5 hours to 24 hours, drying and

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pirolizing in argon atmosphere, respectively is disclosed, for example, on page 2698, column 1, first paragraph.

Furthermore, Loboda et al. is cited as evidence to show according to the precursors on Havemann et al. and Sigh et al., a person of ordinary skill in the art would recognize that the porous oxycarbide film could be formed in Havemann et al. disclosure. Loboda et al. shows silicon oxycarbides as a suitable dielectric material formed over a plurality of circuit elements (col. 3, lines 20-28).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Havemann et al. Sigh et al. reference by including the teaching of Sigh et al. and Loboda et al. The modification would complete a process of making oxycarbide porous layers that would be more thermal stable than conventional porous silica layers and would be employed to reduce capacitance between conductors (Singh et al., page 2704; Havemann et al., col. 2, lines 35-40).

### ***Response to Arguments***

5. Applicant's arguments with respect to claims 49-73, 77, and 79-83 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maria Guerrero whose telephone number is (703) 305-0162.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian, can be reached on (703) 308-4905. The fax phone number for this Group is (703) 308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956.

  
Maria Guerrero

Patent examiner

September 10, 2003